Docket:	:	A.21-01-003
Exhibit Number	:	Cal Adv - ____
Commissioner	:	Martha Guzman Aceves
Administrative Law Judge	:	Daphne Lee
Public Advocates Office		
Witness	:	Isaac Gendler

PUBLIC ADVOCATES OFFICE

REPORT AND RECOMMENDATIONS ON PUMP AND MOTORS

Application 21-01-003

San Francisco, California
May 25, 2021

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MEMORANDUM

The Public Advocates Office at the California Public Utilities Commission (Cal Advocates) examined requests and data presented by San Jose Water Company (SJWC) in Application (A.) 21-01-003 (Application) to provide the California Public Utilities Commission (Commission) with recommendations that represent the interests of SJWC's customers for safe and reliable service at the lowest cost. This Report is prepared by Isaac Gendler. Ting-Pong Yuen is Cal Advocates' project lead for this proceeding. Mukunda Dawadi is the oversight Program and Project Supervisor, and Angela Wuerth is the legal counsel.

Although every effort was made to comprehensively review, analyze, and provide the Commission with recommendations on each ratemaking and policy aspect of the requests presented in the Application, the absence from Cal Advocates' testimony of any particular issue does not constitute its endorsement or acceptance of the underlying request, or the methodology or policy position supporting the request.

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EXECUTIVE SUMMARY

This report presents The Public Advocates Office at the California Public Utility Commission's (Cal Advocates) analysis of San Jose Water Company's (SJWC) requests related to the proposed 2022-2023 capital budgets for pump and motor replacement.

The Commission should authorize SJWC to recover $434,700 in pump and motor replacement costs in TY 2022 and 2023. The budget amount is $737,800 less than what SJWC requested. Cal Advocates developed the pump and motor replacement budget of $434,700 by removing the following seven (five motors, one pump, and one pump and motor project) of the 13 pump and motor replacement projects because these projects have adequate efficiency to continue operation and do not need to be replaced in the current General Rate Case (GRC) cycle:

1. Glenview Station B-1 (Motor component)	$9,300	Index # 5911 for TY 2022
2. Breeding B-2 Motor	$37,000	Index # 5916 for TY 2022
3. Tully Station W-3 Motor	$38,400	Index # 5924 for TY 2022
4. Senter Road Station W-1 Pump	$282,300	Index # 5970 for TY 2022
5. Breeding B-1 Motor	$40,000	Index # 5918 for TY 2023
6. Cottage Grove B-4 Motor	$40,000	Index # 5919 for TY 2023
7. 17th St Station W-12 Pump and Motor	$290,800	Index # 5922 for TY 2023
Total:	$737,800	

PUMP AND MOTOR REPLACEMENT PROJECTS

I. Introduction

This report presents Cal Advocates' analysis of San Jose Water Company's (SJWC) requests related to the 2022-2023 capital budgets for pump and motor replacement and provides its recommendation. Cal Advocates reviewed and analyzed SJWC's testimony, work papers, and SJWC's responses to data requests to determine a reasonable budget for pump and motor replacement.

II. Summary of Recommendations

The Commission should authorize SJWC to recover $434,700 in pump and motor replacement costs in this General Rate Case (GRC) cycle. This $434,700 budget is $737,800 less than what SJWC requested because seven (five motors, one pump, and one combined pump and motor project) of the 13 proposed pump and motor projects have adequate efficiency to continue operation and do not need to be replaced in this GRC cycle. Allowing SJWC to recover the projected cost of these seven proposed but unnecessary pump and motor replacements does not promote efficiency and increases customer bills.

III. Discussion

SJWC requests to recover a projected cost of $1,172,500 for 13 pump and motor replacement projects in 2022 and 2023. These replacement projects are based on SJWC's 6-year capital improvement program, which relies on asset condition, risk, remaining useful life, and sustainable replacement rates documented in SJWC's asset management approach.[1] Table 1-1 below presents SJWC's pump and motor system replacement

[1] A2101003 SJWC Exhibit G, Appendix Chapter 5, p. 15-16.

requests, including breakdowns for pump and motor systems replacement costs separately.[2]

Table 1-1: SJWC Pump and Motor Project Budget Proposal

Budget Year	Index #	Project Name	Total Cost	Cost to Replace Pump Individually	Cost to Replace Motor Individually
2022	5909	Locust Station B-1 Pump and Motor	$73,900	$60,000	$13,900
2022	5911	Glenview Station B-1 Pump and Motor	$55,400	$46,100	$9,300
2022	5915	View Oaks B-2 Pump and Motor	$22,200	$14,700	$7,500
2023	5910	Locust Station B-2 Pump and Motor	$79,900	$65,700	$14,200
2023	5912	Glenview Station B-2 Pump and Motor	$60,900	$51,400	$9,500
2023	5922	17th St Station W-12 Pump and Motor	$290,800	$258,200	$32,600
2022	5908	Regnart Canyon B-2 Pump	$18,500	$18,500	$0
2022	5970	Senter Road Station W-1 Pump	$282,300	$282,300	$0
2023	5913	Williams Road Station B-9 Pump	$133,200	$133,200	$0
2022	5916	Breeding B-2 Motor	$37,000	$0	$37,000
2022	5924	Tully Station W-3 Motor	$38,400	$0	$38,400
2023	5918	Breeding B-1 Motor	$40,000	$0	$40,000
2023	5919	Cottage Grove B-4 Motor	$40,000	$0	$40,000

SJWC's pump and motor replacement policy and methodology overstates the number of pumps and motors that need to be replaced and therefore overestimates the budgets necessary to recover the projected cost for the proposed replacements. Pumps can exceed the design life (time period an asset is expected to function) as anticipated by SJWC and continue to operate efficiently. In addition, pumps that are within the anticipated design life can be inefficient and limited in production levels. Motors must be replaced if their nameplate efficiency does not meet federally mandated National Electrical Manufacturers Association (NEMA) premium efficiency requirements.[3]

[2] See Attachment 4, Attachment to Email. Subject: SJWC Pump-Motor Cost Separation. Date: April 23, 2021. Time: 09:34 am, Sender john.tang@sjwater.com. Recipient: Isaac.gendler@cpuc.ca.gov.
[3] A2101003 SJWC Exhibit G, Appendix 2 –pp. 17. *Motors*.

Given this, the number of pumps and motor replacements and respective budgets proposed by SJWC should be reevaluated and recalculated to prevent unnecessary spending and lessen the impact on customer bills.

When determining which equipment to replace, more weight should be given to the condition of the equipment and level of utilization rather than the age of the equipment alone. This approach optimizes efficiency levels and avoids unnecessary spending. Equipment should not be replaced if it is not being used, still considered used and useful, or considered still efficient. Pumps and motors can be replaced independently of each other.

Cal Advocates used three metrics to determine the reasonability of SJWC's proposed pump replacements, one metric to determine used and usefulness for pump and motor systems, and one metric for motor replacement projects detailed in the following section: Pump Age, Overall Pump Efficiency Score, and Pump Performance Indicator Score for pumps, Water Production for pump and motor systems, and Motor Efficiency for motors. The analysis of these metrics is found in Section E.

A. Pump Age

Pump age is one of the three metrics to determine pump replacement.[4] According to SJWC's testimony, projects that have surpassed their average life expectancy should be replaced. SJWC's pump and motor asset management plan support comparing the age of replacement (how old a pump will be when SJWC plans to replace it) of each pump to the average life expectancy.[5] SJWC states that if a pump exceeded its design life by the time of estimated replacement, the equipment should be replaced.[6]

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[4] A.21-01-003 SJWC Exhibit G, Appendix 2, SJWC Pump and Motor Asset Management Plan, Table 9: Pump Design Lives, p. 18.

[5] Average life expectancy values obtained from A.21-01-003 SJWC Exhibit G, Appendix 2, SJWC Pump and Motor Asset Management Plan, Table 9: Pump Design Lives, p. 19.

[6] Install year for each pump obtained from A.21-01-003 SJWC Exhibit G, Appendix 2, SJWC Pump and Motor Asset Management Plan, Table A-1. Summary of PoF, CoF, and BRE Scores and Flags for Booster Pumps

B. Pump Efficiency Score Metrics

1. Overall Pump Efficiency Score

Each pump is designated a rating of "Low" (poor quality), "Fair" (passable quality that may need replacement soon), "Good" (good quality), or "Excellent" (very high quality), according to its Overall Plant Efficiency score and the metrics laid out in the CPUC Staff Memorandum on Pump Efficiency Ratings.[7] Pumps rated "Low" or "Fair" are identified for replacement during the GRC cycle. As explained later, Cal Advocates used the PG&E hydraulic pump efficiency test results present in Attachment 2 for the Overall Plant Efficiency data.

2. Pump Performance Indicator Score

The Pump Performance Indicator score of each pump is another metric utilized to determine if a pump is due for replacement. The Pump Performance Indicator score normalizes specific energy against the head (height of a liquid column that corresponds to a particular pressure exerted by the liquid column on the base of its container) produced by the pump to provide a consistent comparison across different pressure operation ranges. A perfect pump with a theoretical Overall Plant Efficiency of 100% would have a Pump Performance Indicator score of 3.144 kWh/MG/ft. SJWC provided a score of all the pumps in response to Cal Advocates' data requests.[8]

SJWC and Cal Advocates considers a pump and motor that has a Pump Performance Indicator score of 5 or above to be replaceable.

C. Water Production

SJWC provided annual water production data for all the pumps and motors that SJWC proposes to replace.[9] Table 1-2 below summarizes the water production levels

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[7] Attachment 1: CPUC Memorandum on Efficiency of Water Pump Stations and Equipment Assets.
[8] Attachment 3: Response to Public Advocates Office's data request ISC-008, Attachment 2.
[9] Attachment 4: Attachment to Email. Subject: *Request for Usage Data on Pump Projects*. Date: *March 29, 2021.* Time: *05:14 pm,* Sender *john.tang@sjwater.com*. Recipient: *Isaac.gendler@cpuc.ca.gov*.

since 2012. Of these, two pumps proposed for replacement (Breeding B2 and Cottage Grove B4) were either not utilized or underutilized.

Pumps and motors that are currently not utilized or underutilized should not be replaced. Instead, only pump and motor systems that are considered used and useful should be evaluated and considered for replacement.

Table 1-2: Annual Water Production and Pump and Motor Replacement

	Annual Production (MGs)									
Pump Location and Unit	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**Sufficient Water Production?**
Regnart Canyon B2	0.6	5.8	4.3	2.9	0.6	0.6	2.2	3.0	0.5	Yes
View Oaks B2	2.2	0.9	1.0	2.6	1.9	3.6	3.7	4.9	1.1	Yes
Locust B1	1.5	7.9	12.0	11.9	12.3	14.5	14.9	14.0	15.1	Yes
Locust B2	1.5	16.7	13.4	12.4	12.2	14.2	15.4	14.2	15.3	Yes
Glenview B1	5.0	9.7	8.2	5.1	4.4	5.1	6.3	6.2	8.4	Yes
Glenview B2	12.1	8.8	6.9	6.7	7.9	8.6	9.7	10.0	8.9	Yes
Breeding B1	82.0	0.0	250.1	0.0	3.1	0.1	0.0	0.0	82.8	Yes
Breeding B2	49.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	No
Tully W3	0.9	293.8	210.1	58.5	414.2	296.1	338.1	196.7	343.1	Yes
Senter Road W1	67.7	444.0	412.3	0.1	114.6	341.5	499.4	453.6	454.7	Yes
Williams Rd B9	183.0	505.8	942.2	521.6	448.8	175.2	138.9	226.0	582.2	Yes
Cottage Gove B4	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	No
17th Street W12	559.5	696.1	682.8	0.3	0.2	0.5	0.6	11.3	343.1	Yes

D. Motor Efficiency

The Efficiency Probability of Failure score is the determining factor for motor replacement. SJWC applied the federally mandated National Electrical Manufacturers Association (NEMA) premium efficiency requirements to determine the Efficiency Probability of Failure score for motors.[10] Each motor was designated either as passing or failing.

[10] NEMA Premium Efficiency Requirement scores obtained from A2101003 SJWC Exhibit G, Appendix 2 –pp. 18. Table 7. A score of 1 was passing and a score of 4 was not passing.

Applying the federally mandated National Manufacturers Association premium efficiency requirements is reasonable. Motors with a failing Efficiency Probability of failure score should be replaced and motors with a passing score should not be replaced.

E. Replacement Criteria Determination

Cal Advocates conducted research, analysis, and discovery and identified pump and motor projects that are not ripe for replacement and the Commission should deny SJWC's request to recover the cost of such replacements at this time. Table 1-3 below includes a comparison of each project with a pump system, applies the three metrics discussed above in determining where the replacement is reasonable in addition to the water production metric, and reflects if they should be replaced. Table 1-4 includes a comparison of each project with a motor system, motor efficiency score, and water production to determine if SJWC's proposed replacement is reasonable.

Table 1-3: Project and Pump Efficiency Replacement

Budget Year	Project Name	Size (hp)	Age Past Avg. Life at Expected Ret. Date	Overall Plant Efficiency	Pump Performance Indicator	CPUC Rating	Sufficient Water Production	Replace?
2022	Regnart Canyon B-2 Pump	7.5	7	44.20%	6.8	Low	Yes	Yes
2022	Locust Station B-1 Pump and Motor	20	7	20.53%	4.8	Low	Yes	Yes
2022	Glenview Station B-1 Pump and Motor	10	4	60.80%	4.2	Excellent	Yes	Yes
2022	View Oaks B-2 Pump and Motor	25	4	60.77%	5.3	Good	Yes	Yes
2022	Senter Road Station W-1 Pump	200	-1	69.20%	4.6	Excellent	Yes	**No**
2023	Locust Station B-2 Pump and Motor	20	8	23.57%	4.8	Low	Yes	Yes
2023	Glenview Station B-2 Pump and Motor	10	5	76.73%	4.1	Excellent	Yes	Yes
2023	Williams Road Station B-9 Pump	200	8	75.73%	4.2	Excellent	Yes	Yes
2023	17th St Station W-12 Pump and Motor	125	0	62.70%	4.8	Good	Yes	**No**

Table 1-4: Project and Motor Efficiency Replacement

Budget Year	Project Name	Motor Score	Sufficient Water Production	Replace?
2022	Locust Station B-1 Pump and Motor	4	Yes	Yes
2022	Glenview Station B-1 Pump and Motor	1	Yes	**No**
2022	View Oaks B-2 Pump and Motor	4	Yes	Yes
2022	Breeding B-2 Motor	1	**No**	**No**
2022	Tully Station W-3 Motor	1	Yes	**No**
2023	Locust Station B-2 Pump and Motor	4	Yes	Yes
2023	Glenview Station B-2 Pump and Motor	4	Yes	Yes
2023	Breeding B-1 Motor	1	Yes	**No**
2023	Cottage Grove B-4 Motor	1	**No**	**No**
2023	17th St Station W-12 Pump and Motor	1	Yes	**No**

As presented above in Table 1-3, a pump system is no longer deemed necessary for replacement if all of the following are true: the design life has not been surpassed, Pump Performance Indicator score of less than 5, has a CPUC pump efficiency rating of "Good" or better, and/or produced little if any water for most of the time. Table 1-4 demonstrates that a motor with a passing motor score or produced little if any water for most of the time does not need to be replaced. The Commission should deny SJWC's request to recover cost for the following pump and motor replacement projects:

1. Glenview Station B-1 (Motor component)	$9,300	Index # 5911 for TY 2022
2. Breeding B-2 Motor	$37,000	Index # 5916 for TY 2022
3. Tully Station W-3 Motor	$38,400	Index # 5924 for TY 2022
4. Senter Road Station W-1 Pump	$282,300	Index # 5970 for TY 2022
5. Breeding B-1 Motor	$40,000	Index # 5918 for TY 2023
6. Cottage Grove B-4 Motor	$40,000	Index # 5919 for TY 2023
7. 17th St Station W-12 Pump and Motor	$290,800	Index # 5922 for TY 2023
Total:	$737,800	

IV. Conclusion

The Commission should deny SJWC's request to recover cost for seven (five motors, one pump, and one pump and motor project) of the 13 pump and motor replacement projects, as mentioned above, and only should authorize the utility to recover $434,700 in pump and motor replacement costs during this rate case cycle. This is a reasonable budget amount because it promotes efficiency by avoiding unnecessary spending and protects ratepayers from higher bills.

ATTACHMENT 1: CPUC MEMORANDUM ON EFFICIENCY OF WATER PUMP STATIONS AND EQUIPMENT ASSETS.

State of California

Memorandum

Pump efficiency ratings

GJH

Date : January 26, 1978

To : President Batinovich
Commissioner Sturgeon
Commissioner Symons, Jr.
Commissioner Gravelle
Commissioner Dedrick

From : **Public Utilities Commission — San Francisco** -E. A. Davis, Director
Operations Division

File No.: J-1428

Subject: Efficiency of Water Pumps and Motors

At the Commission Conference of January 24, 1978 there was a discussion regarding the acceptable level of efficiency for water utility pumps (coupled to electric motors). In response to a question from Commissioner Symons, Mr. Andy Garde stated that the acceptable level of efficiency for pumps varies with the size of the pump and the range is approximately between 40% to 60%. He further stated that the efficiency of pump motors is rated as low, fair, good and excellent.

In making the judgement regarding the acceptability of efficiency of pumps, the Operations Division's staff is guided by the staff revised report in Case No. 10114 concerning water conservation. Attached is a table from the staff revised report showing the overall efficiency ranges for various sizes of pumps.

AVC:PA

cc: P. E. Blecher
W. J. Cavagnaro
P. L. Boneysteele
J. D. Reader

Attachment

HYDRAULIC BRANCH

1

Staff Revised Report IN CASE NO 10114
July 11 , 1977 WATER CONSERVATION

TABLE 10
Sheet 2A

STAFF RECOMMENDED WATER CONSERVATION PROGRAM

Engineering

OVERALL PLANT EFFICIENCY RANGES
WIRE TO WATER

MOTOR HP	LOW	FAIR	GOOD	EXCELLENT
3-5	41.9 or less	42-49.9	50-54.9	55 or above
7½-10	44.9 " "	45-52.9	53-57.9	58 " "
15-30	47.9 " "	48-55.9	56-60.9	61 " "
40-60	52.9 " "	53-59.9	60-64.9	65 " "
75-up	55.9 " "	56-62.9	63-68.9	69 " "

ATTACHMENT 2: SJWC'S EXHIBIT - I: SUPPLEMENTAL DATA REQUEST RESPONSE #12: BOOSTER PUMP TEST (EXCERPTS)

STATION/UNIT:	**REGNART CANYON DR. B-2**							
PUMP MFR.:	BURKS	TYPE:	HORIZ	STAGES:	1	SIZE:	1 1/2 x 2	
DESIGN-GPM:	100			DESIGN-TDH:	180	OPE:	50.4%	
MOTOR MFR.:	BALDOR	HP:	7 1/2	VOLTS:	230	FLA:	37	
PUMP INSTALLED:	1995			MOTOR INSTALLED:	1995	M.E.:	81.0%	

POINT TEST NO.		**#1**		**#2**		**#3**		
TEST DATE		**8/22/18**		**8/22/18**		**8/22/18**		
MEGGER READING	30 secs.							
	60 secs.	4500 M						
		A		B		C		
PRE-BREAKER TEMP.			F		F		F	
POST-BREAKER TEMP.			F		F		F	
PRE-STARTER TEMP.			F		F		F	
POST-STARTER TEMP.			F		F		F	
VOLTAGE OPEN CIR.	A-B	144						
	A-C							
	B-C	248						
VOLTAGE RUN	A-B	122		122		122		
	A-C							
	B-C	244		244		244		
CURRENT	A	35.0		31.0		26.0		
	B	35.0		31.0		26.0		
	C	35.0		31.0		26.0		
KW		6.0		6.0		4.0		
KVAR		3.0		3.0		3.0		
KVA		7.0		6.0		5.0		
POWER FACTOR		91.0%		89.0%		79.0%		
HPI		8.0		8.0		5.4		
BHP		6.5		6.5		4.3		
MOTOR LOAD		86.9%		86.9%		57.9%		
STATIC SUCTION HD.	(psi)	5.4						
STATIC DISCHARGE HD.	(psi)	74.0						
RUN DISCHARGE HD.	(psi)	75.5		76.0		78.0		
RUN SUCTION HD.	(psi)	5.4		5.4		5.4		
PIPE DIAMETER	(in.)	1.50		1.50		1.50		
VELOCITY HD.	(ft.)	4.0		3.2		1.8		
TOTAL HEAD	(ft.)	161.9		163.1		167.7		
TOTAL DYNAMIC HD.	(ft.)	165.9		166.3		169.6		
GPM		88		79		60		
WHP		3.6		3.3		2.5		
KWH/MG.		1,136		1,266		1,111		
PUMP EFF.		55.2%		49.9%		58.5%		
OVERALL PLANT EFF.		**44.7%**		**40.5%**		**47.4%**		

TESTED BY: T. BUI, D. FINLEY

STATION/UNIT:	VIEW OAKS WAY B-2								
PUMP MFR.:	GRUNDFOS	TYPE:	VSS	STAGES:	8	SIZE:	CR30-80		
DESIGN-GPM:	123			DESIGN-TDH:	496	OPE:	60.5%		
MOTOR MFR.:	BALDOR (HE)	HP:	25	VOLTS:	460	FLA:	29		
PUMP INSTALLED:	1998			MOTOR INSTALLED:	1998	M.E.:	88.5%		

POINT TEST NO.		#1		#2		#3		#4
TEST DATE		9/24/17		9/24/17		9/24/17		
MEGGER READING	30 secs.							
	60 secs.	4500 M						
		A		B		C		
PRE-BREAKER TEMP.		80	F	80	F	79	F	
POST-BREAKER TEMP.		81	F	83	F	81	F	
PRE-STARTER TEMP.		80	F	80	F	79	F	
POST-STARTER TEMP.		83	F	84	F	82	F	
VOLTAGE OPEN CIR.	A-B	482						
	A-C	482						
	B-C	485						
VOLTAGE RUN	A-B	482		483		483		
	A-C	482		483		482		
	B-C	485		485		485		
CURRENT	A	31.0		31.0		30.0		
	B	31.0		30.0		30.0		
	C	31.0		30.0		30.0		
KW		22.0		22.0		22.0		
KVAR		12.0		12.0		12.0		
KVA		26.0		25.0		25.0		
POWER FACTOR		87.0%		87.0%		86.0%		
HPI		29.5		29.5		29.5		
BHP		26.1		26.1		26.1		
MOTOR LOAD		104.4%		104.4%		104.4%		
STATIC SUCTION HD.	(psi)	11.5						
STATIC DISCHARGE HD.	(psi)	151.0						
RUN DISCHARGE HD.	(psi)	164.0		194.0		210.0		
RUN SUCTION HD.	(psi)	6.0		6.1		8.0		
PIPE DIAMETER	(in.)	2.5		2.5		2.5		
VELOCITY HD.	(ft.)	2.3		1.9		1.6		
TOTAL HEAD	(ft.)	365.0		434.0		466.6		
TOTAL DYNAMIC HD.	(ft.)	367.3		435.9		468.2		
GPM		188		168		153		
WHP		17.3		18.4		18.0		
KWH/MG.		1,950		2,183		2,397		
PUMP EFF.		66.4%		70.6%		69.1%		
OVERALL PLANT EFF.		**58.8%**		**62.4%**		**61.1%**		

NOTES

TESTED BY: D.BERTRON, D.FINLEY

STATION/UNIT:	**LOCUST DR. B-1**							
PUMP MFR.:	PEERLESS	TYPE:	VHS	STAGES:	6	SIZE:	6 LB	
DESIGN-GPM:	125			DESIGN-TDH:	350	OPE:	64.3%	
MOTOR MFR.:	US	HP:	20	VOLTS:	460	FLA:	25.2	
PUMP INSTALLED:	1990			MOTOR INSTALLED:	1990	M.E.:	86.5%	

POINT TEST NO.		**#1**		**#2**		**#3**		
TEST DATE		**5/9/19**		**5/9/19**		**5/9/19**		
MEGGER READING	30 secs.	5000 M						
	60 secs.	5000 M						
		A		B		C		
PRE-BREAKER TEMP.		63	F	65	F	65	F	
POST-BREAKER TEMP.		63	F	65	F	65	F	
PRE-STARTER TEMP.		73	F	70	F	68	F	
POST-STARTER TEMP.		74	F	70	F	67	F	
VOLTAGE OPEN CIR.	A-B	484						
	A-C	475						
	B-C	483						
VOLTAGE RUN	A-B	477		478		476		
	A-C	470		471		469		
	B-C	478		477		475		
VOLTAGE IMBALANCE		1.1%		0.9%		0.9%		
CURRENT	A	24.1		22.4		20.8		
	B	22.4		20.4		19.1		
	C	21.3		19.7		18.2		
CURRENT IMBALANCE		6.6%		7.5%		7.4%		
KW		45.0		41.0		37.0		
KVAR		18.1		16.9		15.5		
KVA		18.7		17.4		15.9		
POWER FACTOR		23.9%		23.7%		23.1%		
HPI		60.3		55.0		49.6		
BHP		52.2		47.5		42.9		
MOTOR LOAD		260.9%		237.7%		214.5%		
STATIC SUCTION HD.	(psi)	3.5						
STATIC DISCHARGE HD.	(psi)	143.0						
RUN DISCHARGE HD.	(psi)	175.0		186.5		194.5		
RUN SUCTION HD.	(psi)	3.4		3.4		3.4		
DISCHARGE PIPE DIAMETER	(in.)	4		4		4		
VELOCITY HD.	(ft.)	0.2		0.1		0.1		
TOTAL HEAD	(ft.)	396.4		423.0		441.4		
TOTAL DYNAMIC HD.	(ft.)	396.6		423.1		441.5		
GPM		145		104		77		
WHP		14.5		11.1		8.6		
KWH/MG.		5173		6571		8009		
PUMP EFF.		27.8%		23.4%		20.0%		
OVERALL PLANT EFF.		**24.1%**		**20.2%**		**17.3%**		

NOTES:

TESTED BY: T. BUI, R. SIPES

STATION/UNIT:	LOCUST DR. B-2								
PUMP MFR.:	PEERLESS	TYPE:	VHS	STAGES:	6	SIZE:	6 LB		
DESIGN-GPM:	125			DESIGN-TDH:	350	OPE:	64.3%		
MOTOR MFR.:	US	HP:	20	VOLTS:	460	FLA:	25.2		
PUMP INSTALLED:	1990			MOTOR INSTALLED:	1990	M.E.:	86.5%		

POINT TEST NO.		**#1**		**#2**		**#3**		
TEST DATE		**5/9/19**		**5/9/19**		**5/9/19**		
MEGGER READING	30 secs.	5000 M						
	60 secs.	5000 M						
		A		B		C		
PRE-BREAKER TEMP.		65	F	67	F	68	F	
POST-BREAKER TEMP.		67	F	66	F	66	F	
PRE-STARTER TEMP.		65	F	64	F	66	F	
POST-STARTER TEMP.		75	F	73	F	68	F	
VOLTAGE OPEN CIR.	A-B	484						
	A-C	476						
	B-C	483						
VOLTAGE RUN	A-B	477		479		480		
	A-C	470		472		472		
	B-C	477		478		477		
VOLTAGE IMBALANCE		1.0%		0.9%		0.9%		
CURRENT	A	24.2		21.7		19.9		
	B	21.0		18.8		17.3		
	C	22.1		19.3		17.5		
CURRENT IMBALANCE		7.9%		8.9%		9.1%		
KW		45.0		39.0		34.0		
KVAR		17.9		16.4		14.7		
KVA		18.5		16.0		15.1		
POWER FACTOR		24.3%		23.2%		22.5%		
HPI		60.3		52.3		45.6		
BHP		52.2		45.2		39.4		
MOTOR LOAD		260.9%		226.1%		197.1%		
STATIC SUCTION HD.	(psi)	3.5						
STATIC DISCHARGE HD.	(psi)	142.5						
RUN DISCHARGE HD.	(psi)	171.9		191.0		197.5		
RUN SUCTION HD.	(psi)	3.4		3.5		3.5		
DISCHARGE PIPE DIAMETER	(in.)	4		4		4		
VELOCITY HD.	(ft.)	0.2		0.1		0.1		
TOTAL HEAD	(ft.)	389.2		433.1		448.1		
TOTAL DYNAMIC HD.	(ft.)	389.5		433.3		448.2		
GPM		147		116		90		
WHP		14.5		12.7		10.2		
KWH/MG.		5102		5604		6296		
PUMP EFF.		27.7%		28.1%		25.8%		
OVERALL PLANT EFF.		**24.0%**		**24.3%**		**22.4%**		

NOTES:

TESTED BY: T. BUI, R. SIPES

STATION/UNIT:	**GLENVIEW DR. B-1**							
PUMP MFR.:	ING.-DRESS.	TYPE:	VHS	STAGES:	2	SIZE:	10 KKH	
DESIGN-GPM:	400			DESIGN-TDH:	69	OPE:	69.0%	
MOTOR MFR.:	US (HE)	HP:	10	VOLTS:	230	FLA:	24.6	
PUMP INSTALLED:	1998			MOTOR INSTALLED:	1998	M.E.:	90.2%	

POINT TEST NO.		**#1**		**#2**		**#3**		
TEST DATE		**2/20/20**		**2/20/20**		**2/20/20**		
MEGGER READING	30 secs.	5000 M						
	60 secs.	5000 M						
		A		B		C		
PRE-BREAKER TEMP.		85	F	86	F	87	F	
POST-BREAKER TEMP.		81	F	82	F	83	F	
PRE-STARTER TEMP.		79	F	79	F	79	F	
POST-STARTER TEMP.		78	F	80	F	80	F	
VOLTAGE OPEN CIR.	A-B	247						
	A-C	246						
	B-C	244						
VOLTAGE RUN	A-B	244		244		244		
	A-C	245		245		245		
	B-C	243		243		243		
VOLTAGE IMBALANCE		0.4%		0.4%		0.4%		
CURRENT	A	23.9		20.9		19.3		
	B	23.5		20.8		19.1		
	C	24.2		21.2		19.5		
CURRENT IMBALANCE		1.5%		1.1%		1.0%		
KW		8.6		7.4		6.7		
KVAR		5.3		4.9		8.2		
KVA		10.1		8.9		4.7		
POWER FACTOR		85.2%		83.7%		82.3%		
HPI		11.5		9.9		9.0		
BHP		10.4		8.9		8.1		
MOTOR LOAD		104.0%		89.5%		81.0%		
STATIC SUCTION HD.	(psi)	92.0						
STATIC DISCHARGE HD.	(psi)	113.0						
RUN DISCHARGE HD.	(psi)	118.0		124.0		128.0		
RUN SUCTION HD.	(psi)	91		91		91		
DISCHARGE PIPE DIAMETER	(in.)	8		8		8		
VELOCITY HD.	(ft.)	0.1		0.1		0.0		
TOTAL HEAD	(ft.)	62.4		76.2		85.5		
TOTAL DYNAMIC HD.	(ft.)	62.5		76.3		85.5		
GPM		468		328		227		
WHP		7.4		6.3		4.9		
KWH/MG.		306		376		492		
PUMP EFF.		71.0%		70.6%		60.5%		
OVERALL PLANT EFF.		**64.1%**		**63.7%**		**54.6%**		

NOTES:

TESTED BY: T. BUI, D.GAMBILL,S.MURRAY

STATION/UNIT:	GLENVIEW DR. B-2								
PUMP MFR.:	ING.-DRESS.	TYPE:	VHS	STAGES:	2	SIZE:	10 KKH		
DESIGN-GPM:	400			DESIGN-TDH:	69	OPE:	69.0%		
MOTOR MFR.:	US (HE)	HP:	10	VOLTS:	230	FLA:	24.6		
PUMP INSTALLED:	1998			MOTOR INSTALLED:	1998	M.E.:	90.2%		

POINT TEST NO.		#1		#2		#3		
TEST DATE		5/30/18		5/30/18		5/30/18		
MEGGER READING	30 secs.	3012						
	60 secs.	3968						
		A		B		C		
PRE-BREAKER TEMP.		76	F	76	F	77	F	
POST-BREAKER TEMP.		72	F	73	F	74	F	
PRE-STARTER TEMP.		71	F	72	F	71	F	
POST-STARTER TEMP.		70	F	74	F	73	F	
VOLTAGE OPEN CIR.	A-B	242						
	A-C	243						
	B-C	241						
VOLTAGE RUN	A-B	242		242		244		
	A-C	243		243		244		
	B-C	241		241		242		
CURRENT	A	23.0		21.0		20.0		
	B	23.0		22.0		20.0		
	C	24.0		22.0		20.0		
KW		8.0		7.0		7.0		
KVAR		5.0		5.0		4.0		
KVA		8.0		9.0		8.0		
POWER FACTOR		84.0%		84.0%		83.0%		
HPI		10.7		9.4		9.4		
BHP		9.7		8.5		8.5		
MOTOR LOAD		96.7%		84.6%		84.6%		
STATIC SUCTION HD.	(psi)	93.5						
STATIC DISCHARGE HD.	(psi)	116.0						
RUN DISCHARGE HD.	(psi)	120.0		126.5		129.5		
RUN SUCTION HD.	(psi)	92.5		92.5		92.5		
PIPE DIAMETER	(in.)	9		9		9		
VELOCITY HD.	(ft.)	0.1		0.1		0.0		
TOTAL HEAD	(ft.)	63.5		78.5		85.5		
TOTAL DYNAMIC HD.	(ft.)	63.6		78.6		85.5		
GPM		505		398		307		
WHP		8.1		7.9		6.6		
KWH/MG.		264		293		380		
PUMP EFF.		83.7%		93.3%		78.3%		
OVERALL PLANT EFF.		**75.5%**		**84.1%**		**70.6%**		

NOTES

TESTED BY: D. FINLEY, T. BUI

STATION/UNIT:	**BREEDING B-2**							
PUMP MFR.:	GOULDS	TYPE:	VHS	STAGES:	3	SIZE:	14 RHMC	
DESIGN-GPM:	2150			DESIGN-TDH:	218	OPE:	79.4%	
MOTOR MFR.:	GE (HE)	HP:	150	VOLTS:	460	FLA:	165	
PUMP INSTALLED:	2008			MOTOR INSTALLED:	1990	M.E.:	95.0%	

POINT TEST NO.		**#1**		**#2**		**#3**		
TEST DATE		**9/12/14**		**9/12/14**		**9/12/14**		
MEGGER READING	30 secs.							
	60 secs.	.4 M						
		A		B		C		
PRE-BREAKER TEMP.		89	F	88	F	87	F	
POST-BREAKER TEMP.		80	F	80	F	81	F	
PRE-STARTER TEMP.		88	F	87		86	F	
POST-STARTER TEMP.		82	F	82	F	80	F	
VOLTAGE OPEN CIR.	A-B	487						
	A-C	487						
	B-C	487						
VOLTAGE RUN	A-B	481		481		482		
	A-C	481		481		482		
	B-C	481		481		482		
CURRENT	A	161.0		160.0		151.0		
	B	163.0		162.0		153.0		
	C	160.0		159.0		149.0		
KW		115.0		114.0		106.0		
KVAR		71.0		70.0		67.0		
KVA		135.0		134.0		126.0		
POWER FACTOR		85.0%		87.0%		84.0%		
HPI		154.2		152.8		142.1		
BHP		146.4		145.2		135.0		
MOTOR LOAD		97.6%		96.8%		90.0%		
STATIC SUCTION HD.	(psi)	5.5						
STATIC DISCHARGE HD.	(psi)	85.0						
RUN DISCHARGE HD.	(psi)	88.0		103.0		115.0		
RUN SUCTION HD.	(psi)	5.0		5.0		5.0		
PIPE DIAMETER	(in.)	10		10		10		
VELOCITY HD.	(ft.)	1.6		1.1		0.6		
TOTAL HEAD	(ft.)	191.7		226.4		254.1		
TOTAL DYNAMIC HD.	(ft.)	193.3		227.5		254.7		
GPM		2,466		2,093		1,519		
WHP		119.4		119.6		97.5		
KWH/MG.		777		908		1,163		
PUMP EFF.		81.5%		82.4%		72.2%		
OVERALL PLANT EFF.		**77.5%**		**78.3%**		**68.6%**		

NOTES

TESTED BY: D. GEHRET, J. DODD

STATION/UNIT:	BREEDING B-1								
PUMP MFR.:	GOULDS	TYPE:	VHS	STAGES:	3	SIZE:	14 RHMC		
DESIGN-GPM:	2150			DESIGN-TDH:	218	OPE:	79.4%		
MOTOR MFR.:	GE (HE)	HP:	150	VOLTS:	460	FLA:	165		
PUMP INSTALLED:	2008			MOTOR INSTALLED:	1990	M.E.:	95.0%		

POINT TEST NO.		#1		#2		#3		
TEST DATE		9/12/14		9/12/14		9/12/14		
MEGGER READING	30 secs.							
	60 secs.	163 M						
		A		B		C		
PRE-BREAKER TEMP.		87	F	88	F	88	F	
POST-BREAKER TEMP.		90	F	91	F	90	F	
PRE-STARTER TEMP.		92	F	94	F	96	F	
POST-STARTER TEMP.		89	F	90	F	89	F	
VOLTAGE OPEN CIR.	A-B	487						
	A-C	487						
	B-C	487						
VOLTAGE RUN	A-B	482		480		480		
	A-C	482		480		480		
	B-C	483		481		479		
CURRENT	A	160.0		160.0		144.0		
	B	162.0		163.0		146.0		
	C	159.0		160.0		143.0		
KW		114.0		114.0		101.0		
KVAR		71.0		71.0		66.0		
KVA		134.0		134.0		121.0		
POWER FACTOR		84.0%		85.0%		84.0%		
HPI		152.8		152.8		135.4		
BHP		145.2		145.2		128.6		
MOTOR LOAD		96.8%		96.8%		85.7%		
STATIC SUCTION HD.	(psi)	7.0						
STATIC DISCHARGE HD.	(psi)	79.0						
RUN DISCHARGE HD.	(psi)	86.0		100.0		115.0		
RUN SUCTION HD.	(psi)	6.5		6.5		6.5		
PIPE DIAMETER	(in.)	10		10		10		
VELOCITY HD.	(ft.)	1.7		1.3		0.5		
TOTAL HEAD	(ft.)	183.6		216.0		250.6		
TOTAL DYNAMIC HD.	(ft.)	185.3		217.2		251.2		
GPM		2,535		2,195		1,446		
WHP		117.6		119.7		91.5		
KWH/MG.		750		866		1,164		
PUMP EFF.		81.0%		82.5%		71.2%		
OVERALL PLANT EFF.		**76.9%**		**78.3%**		**67.6%**		

NOTES

TESTED BY: D. GEHRET, L. DODD

STATION/UNIT:	**WILLIAMS RD. B-9**							
PUMP MFR.:	BJ	TYPE:	VHS	STAGES:	2	SIZE:	18 KXL	
DESIGN-GPM:	3500			DESIGN-TDH:	210	OPE:	79.1%	
MOTOR MFR.:	GE (HE)	HP:	200	VOLTS:	460	FLA:	216	
PUMP INSTALLED:	1995			MOTOR INSTALLED:	1988	M.E.:	94.7%	

POINT TEST NO.		**#1**		**#2**		**#3**		
TEST DATE		**7/27/17**		**7/27/17**		**7/27/17**		
MEGGER READING	30 secs.							
	60 secs.	685						
		A		B		C		
PRE-BREAKER TEMP.		84	F		F		F	
POST-BREAKER TEMP.		95	F		F		F	
PRE-STARTER TEMP.		79	F		F		F	
POST-STARTER TEMP.		86	F		F		F	
VOLTAGE OPEN CIR.	A-B							
	A-C							
	B-C							
VOLTAGE RUN	A-B	489		489		489		
	A-C	495		495		495		
	B-C	485		491		491		
CURRENT	A	203.0		206.0		201.0		
	B	219.0		220.0		215.0		
	C	212.0		213.0		211.0		
KW		153.6		155.3		151.7		
KVAR		94.3		95.1		92.9		
KVA		180.2		182.6		178.6		
POWER FACTOR		85.3%		84.9%		84.8%		
HPI		205.9		208.2		203.4		
BHP		195.0		197.1		192.6		
MOTOR LOAD		97.5%		98.6%		96.3%		
STATIC SUCTION HD.	(psi)	7.5						
STATIC DISCHARGE HD.	(psi)	84.0						
RUN DISCHARGE HD.	(psi)	88.0		99.0		110.0		
RUN SUCTION HD.	(psi)	6.5		6.5		5.5		
PIPE DIAMETER	(in.)	12		12		12		
VELOCITY HD.	(ft.)	1.3		1.1		0.8		
TOTAL HEAD	(ft.)	188.3		213.7		241.4		
TOTAL DYNAMIC HD.	(ft.)	189.6		214.8		242.2		
GPM		3,243		2,999		2,490		
WHP		154.2		161.8		151.8		
KWH/MG.		789		863		1,015		
PUMP EFF.		79.1%		82.1%		78.8%		
OVERALL PLANT EFF.		**74.9%**		**77.7%**		**74.6%**		

NOTES

TESTED BY: M.SMALLMAN, R.SIPES

STATION/UNIT:	COTTAGE GROVE AVE. B-4								
PUMP MFR.:	PEERLESS	TYPE:	VHS	STAGES:	3	SIZE:	14 MD		
DESIGN-GPM:	2215			DESIGN-TDH:	215	OPE:	79.2%		
MOTOR MFR.:	GE(HE)	HP:	150	VOLTS:	460	FLA:	165		
PUMP INSTALLED:	2003			MOTOR INSTALLED:	1985	M.E.:	95.0%		

POINT TEST NO.		#1		#2		#3		
TEST DATE		5/29/13		5/29/13		5/29/13		
MEGGER READING	30 secs.							
	60 secs.	82 M						
		A		B		C		
PRE-BREAKER TEMP.		83	F	90	F	94	F	
POST-BREAKER TEMP.		84	F	85	F	85	F	
PRE-STARTER TEMP.		80	F	81	F	83	F	
POST-STARTER TEMP.		78	F	77	F	77	F	
VOLTAGE OPEN CIR.	A-B	494						
	A-C	492						
	B-C	490						
VOLTAGE RUN	A-B	492		494		494		
	A-C	490		492		492		
	B-C	488		490		490		
CURRENT	A	177.0		168.0		161.0		
	B	162.0		152.0		147.0		
	C	164.0		155.0		148.0		
KW		122.0		114.0		109.0		
KVAR		76.0		73.0		71.0		
KVA		144.0		136.0		130.0		
POWER FACTOR		85.0%		84.0%		84.0%		
HPI		163.5		152.8		146.1		
BHP		155.4		145.2		138.8		
MOTOR LOAD		103.6%		96.8%		92.5%		
STATIC SUCTION HD.	(psi)	6.0						
STATIC DISCHARGE HD.	(psi)	110.0						
RUN DISCHARGE HD.	(psi)	121.0		130.0		140.0		
RUN SUCTION HD.	(psi)	5.0		3.5		4.5		
PIPE DIAMETER	(in.)	10		10		10		
VELOCITY HD.	(ft.)	0.7		0.5		0.3		
TOTAL HEAD	(ft.)	268.0		292.2		313.0		
TOTAL DYNAMIC HD.	(ft.)	268.7		292.7		313.3		
GPM		1,689		1,347		1,053		
WHP		114.3		99.4		83.2		
KWH/MG.		1,204		1,411		1,725		
PUMP EFF.		73.6%		68.5%		60.0%		
OVERALL PLANT EFF.		**69.9%**		**65.0%**		**57.0%**		

NOTES:

TESTED BY: M. HJERMSTAD, L. DODD

STATION/UNIT:	TULLY RD. WELL #3								
PUMP MFR.:	PEERLESS	TYPE:	SUB	STAGES:	2	SIZE:	14 MD		
DESIGN-GPM:	2250			DESIGN-TDH:	150	OPE:	67.3%		
MOTOR MFR.:	BJ	HP:	100	VOLTS:	460	FLA:	140		
PUMP INSTALLED:	1998			MOTOR INSTALLED:	1994	M.E.:	88.0%		

POINT TEST NO.		#1		#2		#3		
TEST DATE		7/8/19		7/8/19		7/8/19		
MEGGER READING	30 secs.	31 M						
	60 secs.	33 M						
		A		B		C		
PRE-BREAKER TEMP.		74	F	74	F	73	F	
POST-BREAKER TEMP.		76	F	75	F	76	F	
PRE-STARTER TEMP.		72	F	72	F	72	F	
POST-STARTER TEMP.		74	F	74	F	74	F	
VOLTAGE OPEN CIR.	A-B	469						
	A-C	471						
	B-C	472						
VOLTAGE RUN	A-B	470		470		472		
	A-C	472		471		473		
	B-C	472		472		474		
VOLTAGE IMBALANCE		0.3%		0.2%		0.2%		
CURRENT	A	117		116		111		
	B	120		118		113		
	C	117		116		111		
CURRENT IMBALANCE		1.3%		1.4%		1.3%		
KW		82.3		81.1		78.3		
KVAR		50.7		49.6		48.2		
KVA		96.6		95.3		91.8		
POWER FACTOR		85.1%		85.2%		85.1%		
HPI		110.3		108.7		105.0		
BHP		97.1		95.7		92.4		
MOTOR LOAD		97.1%		95.7%		92.4%		
STANDING WATER LEVEL	(ft.)	45.5		45.5		45.5		
PUMPING WATER LEVEL	(ft.)	76.5		66.5		58.5		
STATIC DISCHARGE HD.	(psi)	5.9						
RUN DISCHARGE HD.	(psi)	6.8		34.9		46.0		
RUN DISCHARGE HD.	(ft.)	15.7		80.6		106.3		
PIPE LENGTH	(ft.)	305		305		305		
PIPE DIAMETER	(in.)	12		12		12		
VELOCITY HD.	(ft.)	1.1		0.5		0.4		
COLUMN HD.	(ft.)	5.6		3.0		2.2		
TOTAL HEAD	(ft.)	92.2		147.1		164.8		
TOTAL DYNAMIC HD.	(ft.)	98.9		150.6		167.3		
GPM		2,904		2,070		1,750		
WHP		72.5		78.7		73.9		
KWH/MG.		472		653		746		
YIELD	(gpm/ft-drdn)	94		99		135		
PUMP EFF.		74.7%		82.3%		80.1%		
OVERALL PLANT EFF.		65.7%		72.4%		70.5%		

NOTES:

TESTED BY: T. BUI, D. GAMBILL

STATION/UNIT:	SENTER RD. WELL #1							
PUMP MFR.:	PEERLESS	TYPE:	VHS	STAGES:	5	SIZE:	14 MC	
DESIGN-GPM:	1800			DESIGN-TDH:	340	OPE:	73.7%	
MOTOR MFR.:	U.S. (H.E.).	HP:	200	VOLTS:	460	FLA:	222	
PUMP INSTALLED:	2008			MOTOR INSTALLED:	2008	M.E.:	95.8%	

POINT TEST NO.		#1		#2		#3		#4
TEST DATE		4/23/18		4/23/18		4/23/18		
MEGGER READING	30 secs.	1226						
	60 secs.	1446						
		A		B		C		
PRE-BREAKER TEMP.		70	F	71	F	70	F	
POST-BREAKER TEMP.		75	F	74	F	71	F	
PRE-STARTER TEMP.		65	F	66	F	67	F	
POST-STARTER TEMP.		67	F	67	F	66	F	
VOLTAGE OPEN CIR.	A-B	482						
	A-C	482						
	B-C	484						
VOLTAGE RUN	A-B	474		472		472		
	A-C	474		473		472		
	B-C	476		474		474		
CURRENT	A	229.0		230.0		228.0		
	B	230.0		231.0		229.0		
	C	226.0		228.0		226.0		
KW		164.0		165.0		163.0		
KVAR		92.0		92.0		91.0		
KVA		188.0		189.0		187.0		
POWER FACTOR		87.0%		87.0%		87.0%		
HPI		219.8		221.2		218.5		
BHP		210.6		211.9		209.3		
MOTOR LOAD		105.3%		105.9%		104.7%		
STANDING WATER LEVEL	(ft.)	54.0		54.0		54.0		
PUMPING WATER LEVEL	(ft.)	100.0		95.0		88.0		
STATIC DISCHARGE HD.	(psi)	66.0						
RUN DISCHARGE HD.	(psi)	87.0		108.0		132.0		
RUN DISCHARGE HD.	(ft.)	201.0		249.5		304.9		
PIPE LENGTH	(ft.)	310		310		310		
PIPE DIAMETER	(in.)	10		10		10		
VELOCITY HD.	(ft.)	0.9		0.8		0.6		
COLUMN HD.	(ft.)	10.9		8.8		6.8		
TOTAL HEAD	(ft.)	301.0		344.5		392.9		
TOTAL DYNAMIC HD.	(ft.)	312.9		354.1		400.3		
GPM		1,911		1,714		1,504		
WHP		151.0		153.2		152.0		
KWH/MG.		1,430		1,604		1,806		
YIELD	(gpm/ft-drdn)	42		42		44		
PUMP EFF.		71.7%		72.3%		72.6%		
OVERALL PLANT EFF.		68.7%		69.3%		69.6%		

NOTE:

TESTED BY:T.BUI,D.FINLEY

STATION/UNIT:	**SEVENTEENTH ST. WELL #12**							
PUMP MFR.:	GOULDS	TYPE:	VHS	STAGES:	3	SIZE:	14 RJMC	
DESIGN-GPM:	2000			DESIGN-TDH:	200	OPE:	71.1%	
MOTOR MFR.:	GE (HE)	HP:	125	VOLTS:	460	FLA:	146	
PUMP INSTALLED:	2008			MOTOR INSTALLED:	1995	M.E.:	94.5%	

POINT TEST NO.		**#1**		**#2**		**#3**		
TEST DATE		**8/26/19**		**8/26/19**		**8/26/19**		
MEGGER READING	30 secs.	56 M						
	60 secs.	61 M						
		A		B		C		
PRE-BREAKER TEMP.		75	F	73	F	73	F	
POST-BREAKER TEMP.		79	F	79	F	79	F	
PRE-STARTER TEMP.		74	F	75	F	74	F	
POST-STARTER TEMP.		79	F	79	F	79	F	
VOLTAGE OPEN CIR.	A-B	490						
	A-C	497						
	B-C	138						
VOLTAGE RUN	A-B	489		487		486		
	A-C	496		494		493		
	B-C	492		490		488		
VOLTAGE IMBALANCE		0.7%		0.7%		0.8%		
CURRENT	A	140		139		130		
	B	159		159		148		
	C	147		146		138		
CURRENT IMBALANCE		6.9%		7.3%		6.7%		
KW		100.9		99.8		93.5		
KVAR		77.5		75.8		72.7		
KVA		127.2		125.6		118.1		
POWER FACTOR		79.3%		79.5%		78.9%		
HPI		135.3		133.8		125.3		
BHP		127.8		126.4		118.4		
MOTOR LOAD		102.3%		101.1%		94.8%		
STANDING WATER LEVEL	(ft.)	31.5		31.5		31.5		
PUMPING WATER LEVEL	(ft.)	130.0		106.5		83.5		
STATIC DISCHARGE HD.	(psi)	0.0						
RUN DISCHARGE HD.	(psi)	14.8		45.2		71.4		
RUN DISCHARGE HD.	(ft.)	34.2		104.4		164.9		
PIPE LENGTH	(ft.)	320		320		320		
PIPE DIAMETER	(in.)	10		10		10		
VELOCITY HD.	(ft.)	1.0		0.7		0.4		
COLUMN HD.	(ft.)	6.8		4.7		2.8		
TOTAL HEAD	(ft.)	164.2		210.9		248.4		
TOTAL DYNAMIC HD.	(ft.)	172.0		216.2		251.6		
GPM		1,950		1,584		1,201		
WHP		84.7		86.5		76.3		
KWH/MG.		862		1,050		1,298		
YIELD	(gpm/ft-drdn)	20		21		23		
PUMP EFF.		66.3%		68.4%		64.4%		
OVERALL PLANT EFF.		**62.6%**		**64.6%**		**60.9%**		

NOTES: TESTED TO B/O

TESTED BY: T. BUI, D. GAMBILL

ATTACHMENT 3: SJWC'S RESPONSE TO CAL ADVOCATES' DR ISC-008, ATTACHMENT 2

Index #	Pump / Motor Name	1a. Pump Efficiency	1b. Efficiency Rating	4. Pump Performance Indicator (PPI)	5. Percent Distance from Q_{bep}
5892	Regnart Canyon B-1 Pump and Motor	53.5%	Low	7.0	15.1%
5906	Bascom B-2 Pump	66.2%	Low	5.0	5.1%
5907	View Oaks B-1 Pump	71.4%	Good	4.9	6.3%
5908	Regnart Canyon B-2 Pump	55.2%	Low	6.8	23.1%
5909	Locust Station B-1 Pump and Motor	75.4%	Good	4.8	4.0%
5910	Locust Station B-2 Pump and Motor	75.1%	Good	4.8	3.3%
5911	Glenview Station B-1 Pump and Motor	81.9%	Very Good	4.2	4.3%
5912	Glenview Station B-2 Pump and Motor	83.7%	Very Good	4.1	4.9%
5913	Williams Road Station B-9 Pump	79.1%	Fair	4.2	10.3%
5915	View Oaks B-2 Pump and Motor	66.4%	Fair	5.3	49.5%
5916	Breeding B-2 Motor	81.5%	Good	4.0	7.3%
5918	Breeding B-1 Motor	81.0%	Good	4.0	10.3%
5919	Cottage Grove B-4 Motor	72.8%	Fair	4.5	3.0%
5921	Will Wool W-1 Pump	67.9%	Low	4.7	8.3%
5922	17th St Station W-12 Pump and Motor	64.3%	Low	4.8	1.4%
5923	12th Street Station W-4 Motor	69.1%	Low	4.8	18.8%
5924	Tully Station W-3 Motor	77.5%	Fair	4.2	10.3%
5925	Santa Rosa Station Pressure System	n/a	n/a	n/a	n/a
5969	Buena Vista B-3 Pump and Motor	80.4%	Good	4.1	2.8%
5970	Senter Road Station W-1 Pump	71.7%	Fair	4.6	5.0%

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ATTACHMENT 4: ATTACHMENT TO EMAIL FROM JOHN TANG, WATER PRODUCTION DATA

	Annual Production (MGs)								
Pump Location and Unit	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Regnart Canyon B1	17.7	13.2	10.0	9.5	10.5	11.2	12.2	8.1	12.0
Regnart Canyon B2	0.6	5.8	4.3	2.9	0.6	0.6	2.2	3.0	0.5
Bascom B2	20.3	635.0	742.0	541.0	477.2	410.7	293.8	455.2	275.4
View Oaks B1	16.0	20.5	17.7	10.0	9.9	12.7	9.3	9.6	16.8
View Oaks B2	2.2	0.9	1.0	2.6	1.9	3.6	3.7	4.9	1.1
Will Wool W1	177.0	0.0	353.4	359.6	0.4	387.1	899.5	355.9	614.5
12th Street W4	2.3	0.1	273.8	175.1	36.9	134.5	255.8	267.3	67.4
Santa Rosa Pressure Sys	8.7	8.1	6.2	4.0	3.0	3.9	4.5	4.6	5.9
Buena Vista B3	403.8	423.7	379.5	115.1	85.3	637.6	277.7	322.5	521.8
Locust B1	1.5	7.9	12.0	11.9	12.3	14.5	14.9	14.0	15.1
Locust B2	1.5	16.7	13.4	12.4	12.2	14.2	15.4	14.2	15.3
Glenview B1	5.0	9.7	8.2	5.1	4.4	5.1	6.3	6.2	8.4
Glenview B2	12.1	8.8	6.9	6.7	7.9	8.6	9.7	10.0	8.9
Breeding B1	82.0	0.0	250.1	0.0	3.1	0.1	0.0	0.0	82.8
Breeding B2	49.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tully W3	0.9	293.8	210.1	58.5	414.2	296.1	338.1	196.7	343.1
Senter Road W1	67.7	444.0	412.3	0.1	114.6	341.5	499.4	453.6	454.7
Williams Rd B9	183.0	505.8	942.2	521.6	448.8	175.2	138.9	226.0	582.2
Cottage Gove B4	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17th Street W12	559.5	696.1	682.8	0.3	0.2	0.5	0.6	11.3	343.1

ATTACHMENT 5: STATEMENT OF QUALIFICATIONS-ISAAC GENDLER

Q1. Please state your name, business address, and position with the California Public Utilities Commission ("Commission").

A1. My name is Isaac Gendler, and my business address is 505 Van Ness Avenue, San Francisco, California 94102. I am a Utilities Engineer in the Water Branch of the Public Advocates Office.

Q2 By whom are you employed and in what capacity?

A2. I am employed by the California Public Utilities Commission Public Advocates Office as a Utilities Engineer.

Q3. Please summarize your education background and professional experience.

A3. I received a Bachelor of Science Degree in Mechanical Engineering from San José State University in May 2019.

I have been with the Public Advocates Office – Water Branch since September 2020.

Q4. What is your responsibility in this proceeding?

A4. I am responsible for covering the pump and motor projects.

Q5. Does this conclude your prepared direct testimony?

A5. Yes, it does.